GIPE JC81
JUN 07 2004
PATENT & TRADEMARK OFFICE

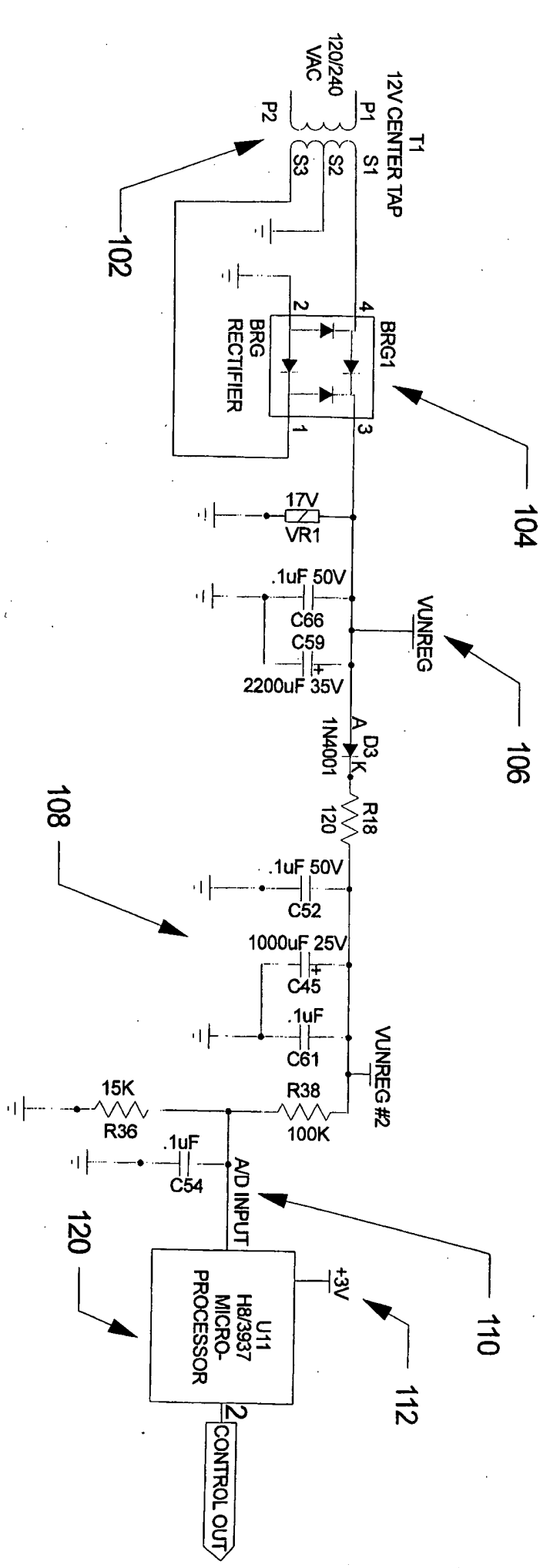

FIG 1

100

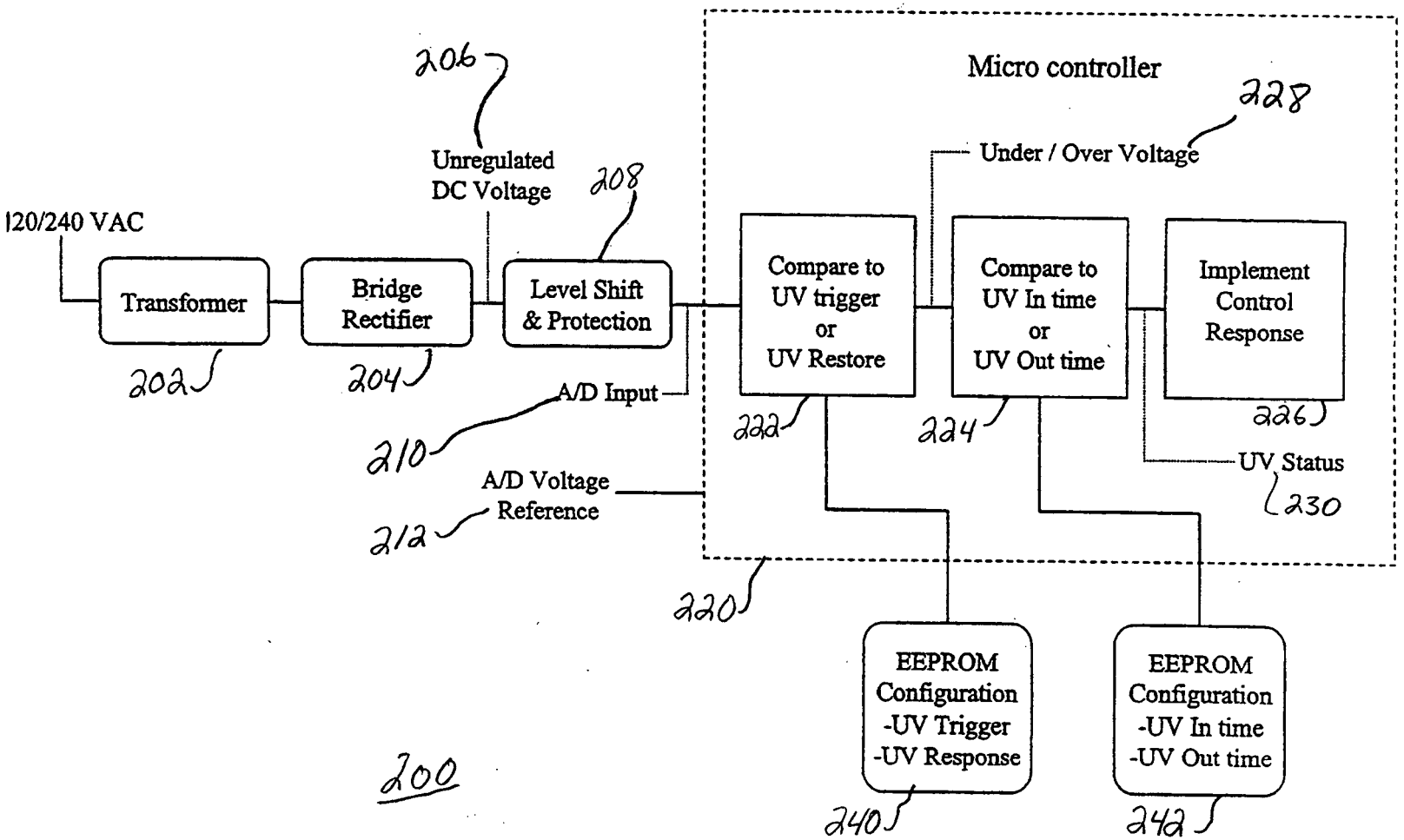
206
Unregulated
DC Voltage
208
Micro controller
228
Under / Over Voltage
120/240 VAC
Transformer
Bridge
Rectifier
Level Shift
& Protection
Compare to
UV trigger
or
UV Restore
Compare to
UV In time
or
UV Out time
Implement
Control
Response
202
204
A/D Input
210
222
224
226
UV Status
230
A/D Voltage
Reference
212
220
EEPROM
Configuration
-UV Trigger
-UV Response
EEPROM
Configuration
-UV In time
-UV Out time
200
240
242

Fig. 2

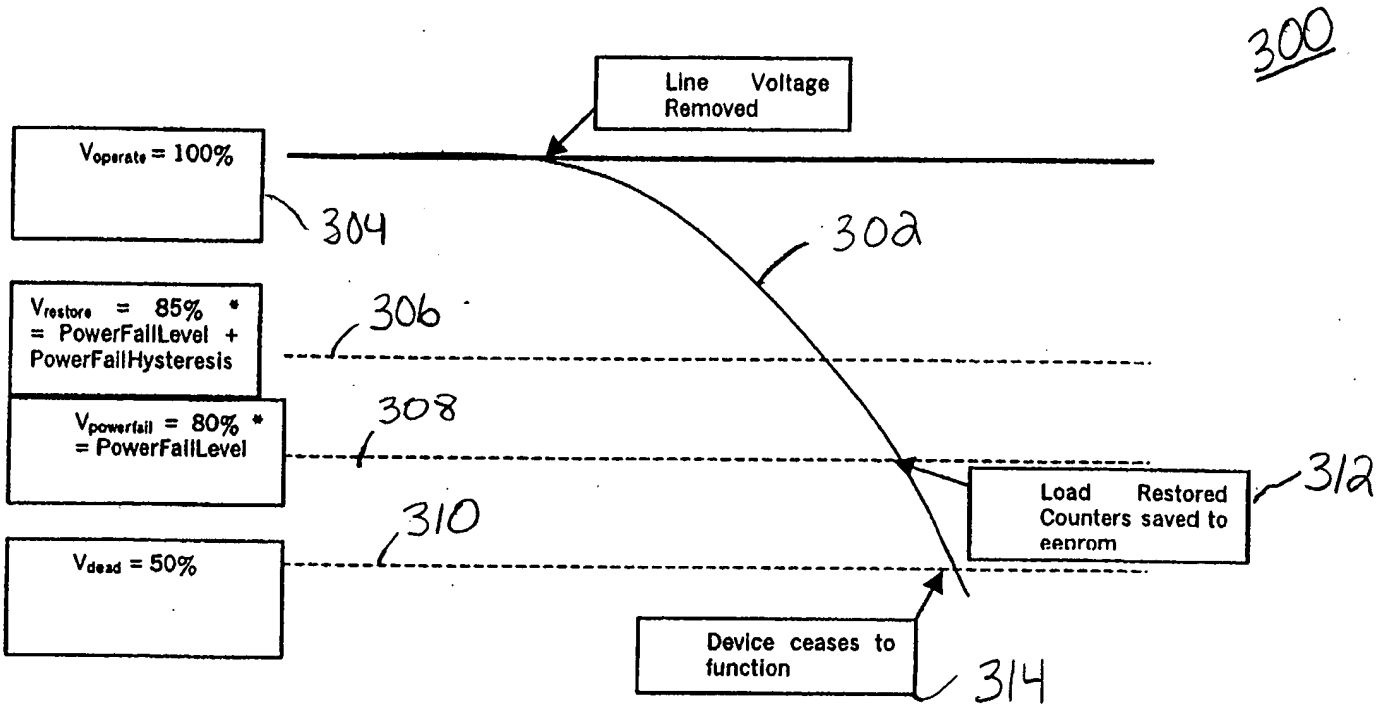
300
Line Voltage Removed
$V_{operate}$ = 100%
304
302
$V_{restore}$ = 85% * = PowerFailLevel + PowerFailHysteresis
306
$V_{powerfail}$ = 80% * = PowerFailLevel
308
312
Load Restored Counters saved to eeprom
310
V_{dead} = 50%
Device ceases to function
314

FIG. 3A

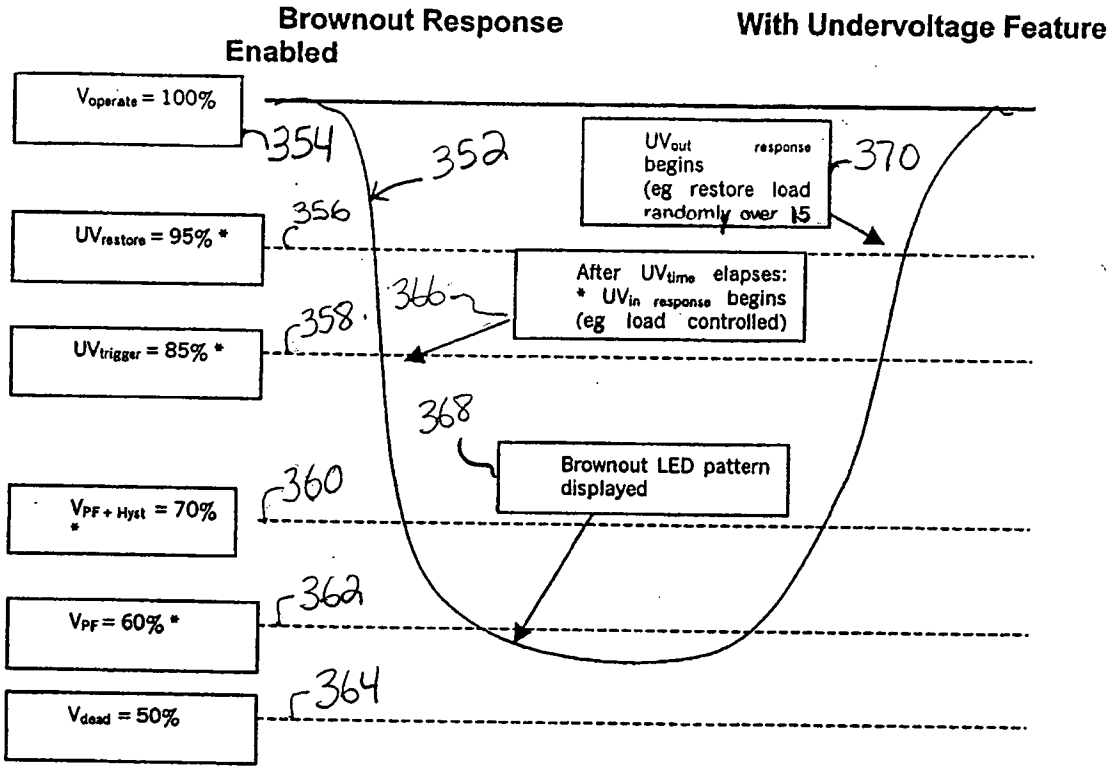
Brownout Response Enabled
With Undervoltage Feature
Voperate = 100%
354
352
UVout response begins (eg restore load randomly over 15
370
356
UVrestore = 95% *
After UVtime elapses: * UVin response begins (eg load controlled)
366
358
UVtrigger = 85% *
368
Brownout LED pattern displayed
360
VPF + Hyst = 70% *
362
VPF = 60% *
364
Vdead = 50%
350

FIG. 3B

Powerfail Response Enabled **With Undervoltage Feature**

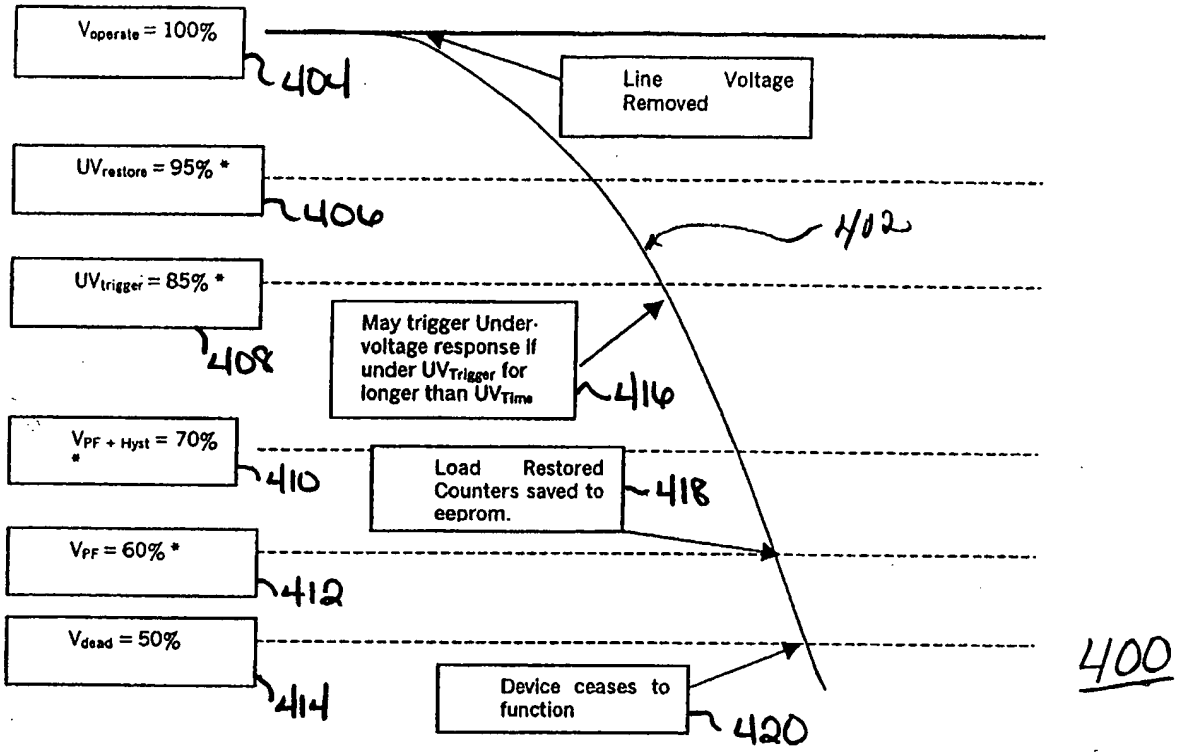

FIG. 4

Power Restore Response
With Undervoltage Feature Enabled

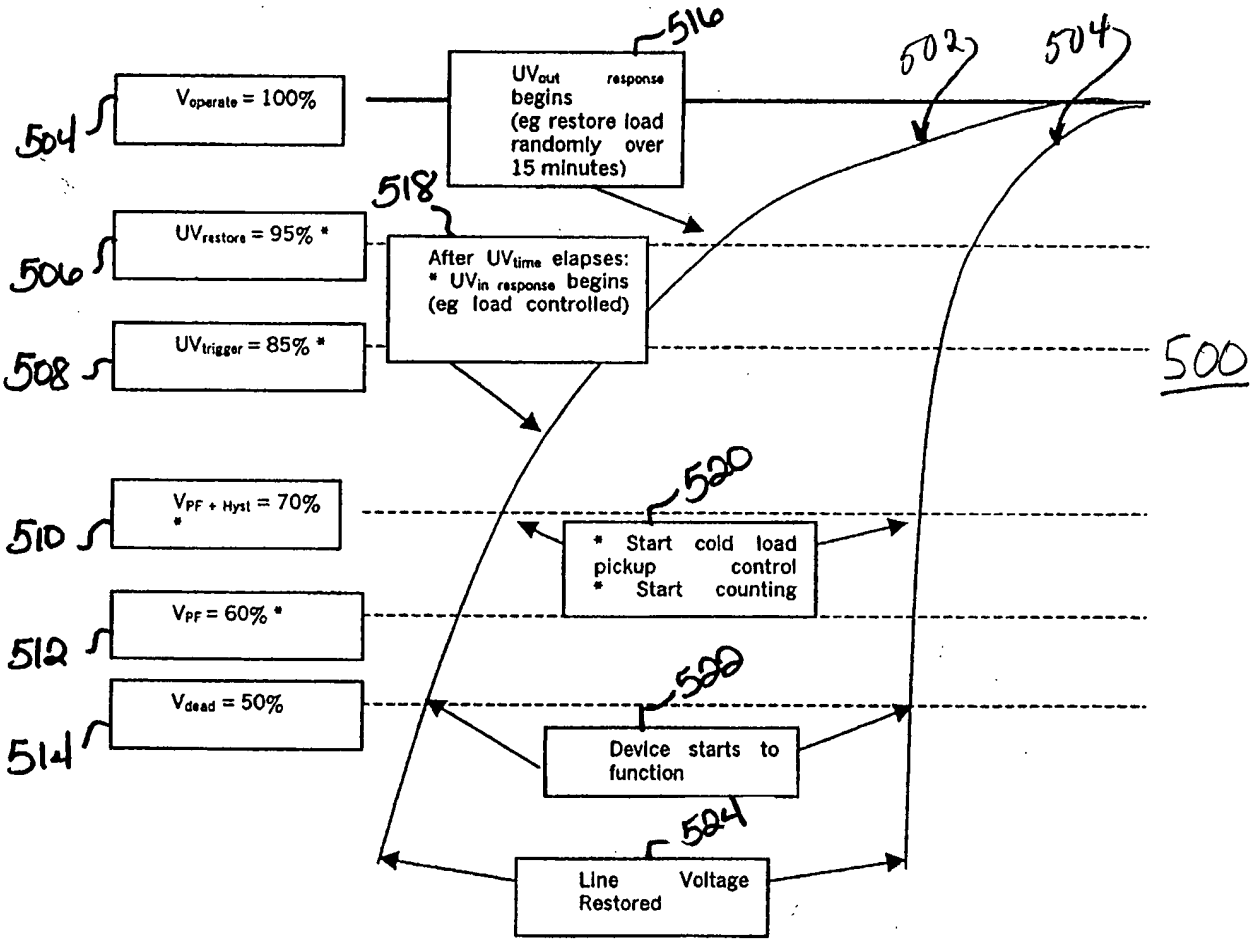

FIG. 5

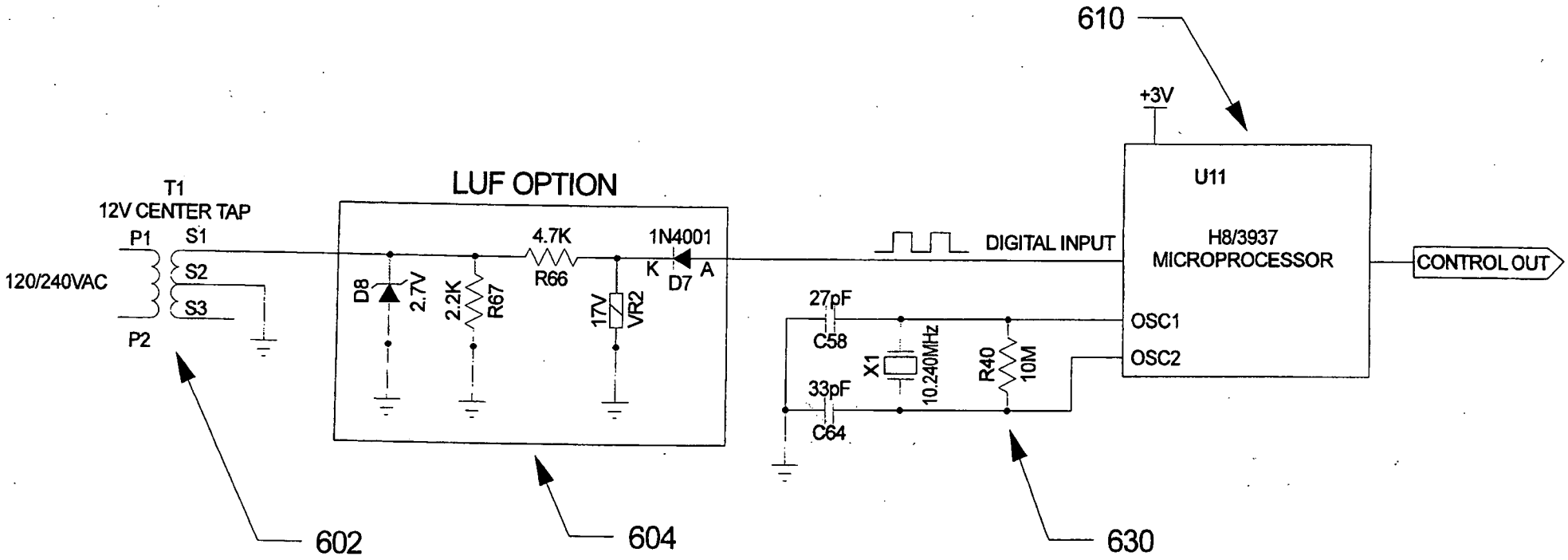
610
+3V
U11
H8/3937
MICROPROCESSOR
CONTROL OUT
T1
12V CENTER TAP
P1
S1
S2
S3
P2
120/240VAC
LUF OPTION
4.7K
R66
1N4001
K
A
D7
D8
2.7V
2.2K
R67
17V
VR2
DIGITAL INPUT
27pF
C58
33pF
C64
X1
10.240MHz
R40
10M
OSC1
OSC2
602
604
630

FIG 6 600

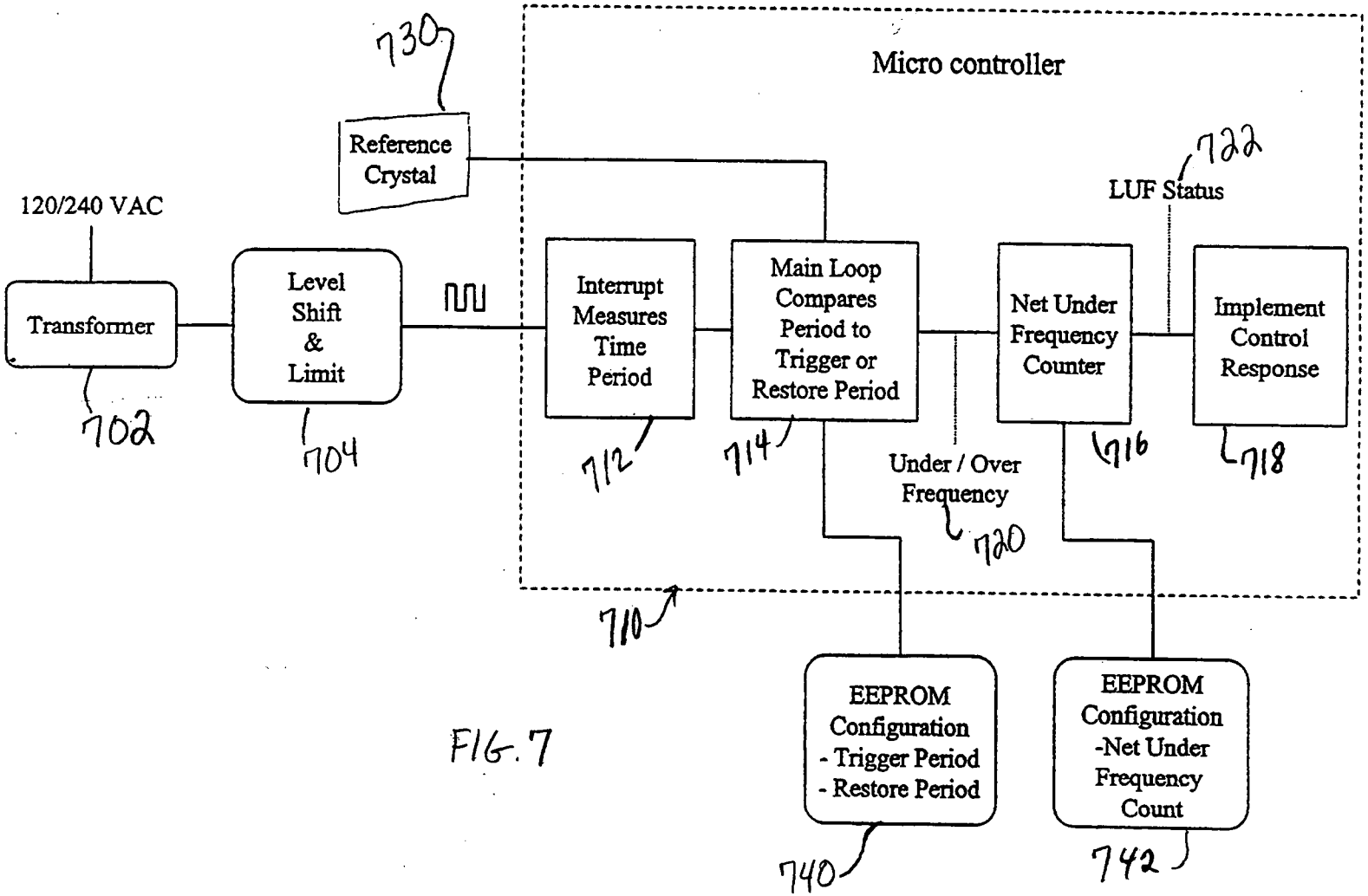
730
Micro controller
Reference Crystal
722
LUF Status
120/240 VAC
Transformer
Level Shift & Limit
Interrupt Measures Time Period
Main Loop Compares Period to Trigger or Restore Period
Net Under Frequency Counter
Implement Control Response
702
704
712
714
716
718
Under / Over Frequency
720
710
EEPROM Configuration - Trigger Period - Restore Period
EEPROM Configuration -Net Under Frequency Count
740
742
700

FIG. 7

1.1.4.1. Normal Operation (LUFStatus = 0)

For each sample, the length of the cycle is compared to the UFT_Trigger. If the cycle length is greater or equal to the trigger, than NUFCount is incremented. If the cycle length is less than the trigger than NUFCount is decremented.

If NUFCount reaches NUFTrigger, then a under frequency condition has been detected and then the LUFInResponse is implemented and the LUFStatus is set.

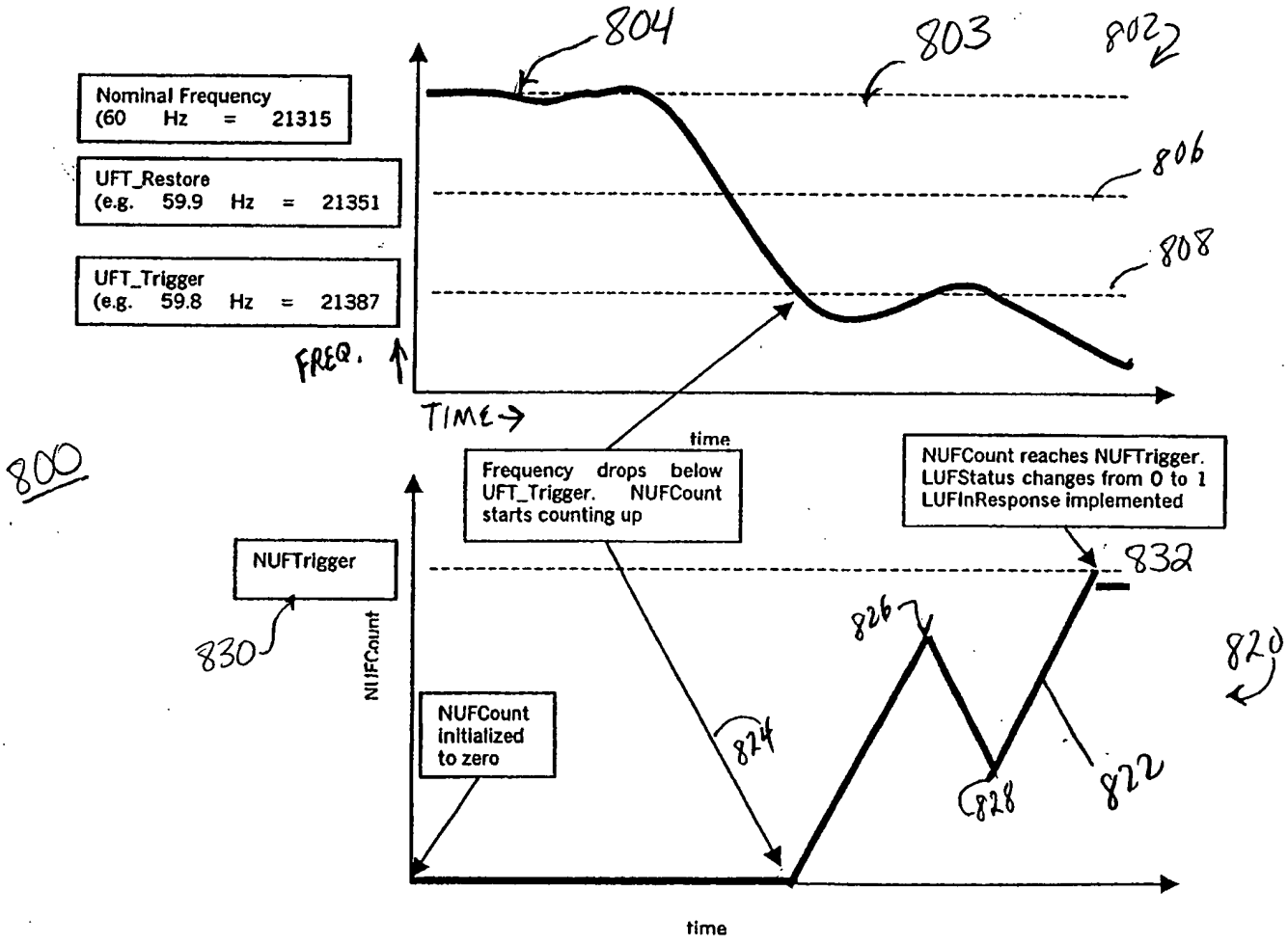

FIG. 8

1.1.4.2. Underfrequency Operation (LUFStatus = 1)

Once LUFStatus is set, then each cycle is compared to UFT_Restore. If the cycle length is greater or equal to the trigger, than NUFCount is incremented. If the cycle length is less than the trigger than NUFCount is decremented.

If NUFCount reaches zero, then the under frequency condition has ceased, and then the LUFOutResponse is implemented and the LUFStatus cleared.

The NUFCount is always in the range of 0..NUFTrigger.

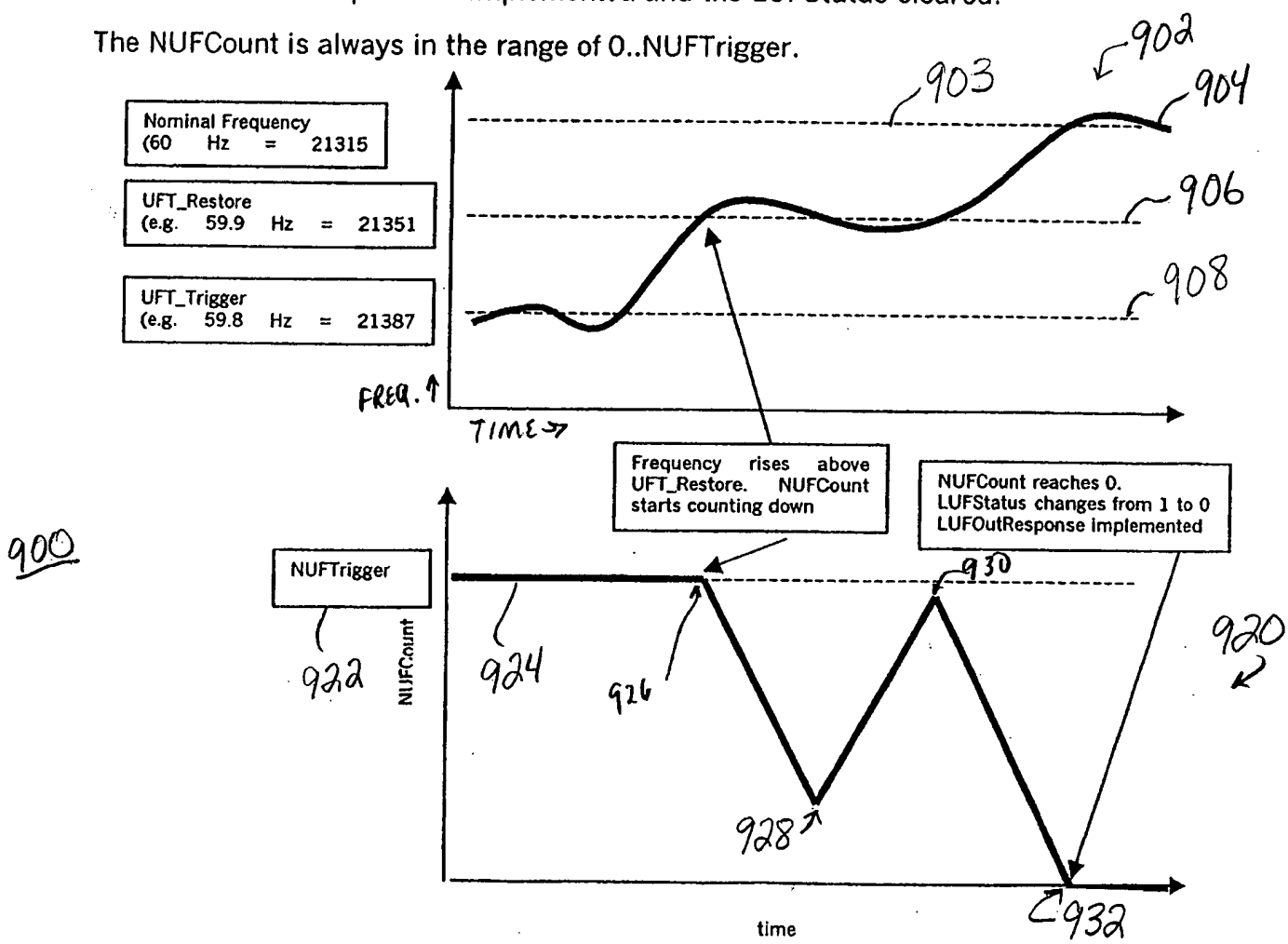

FIG. 9

1.1.5. OPERATION (ALGORITHM)

For each power line cycle:

If LUFStatus is Normal

If MLP >= UFT_Trigger

Increment NUFCount

Else

Decrement NUFCount

If NUFCount>=NUFTrigger AND NUFTrigger is non-zero

Set LUFStatus to Under-Frequency

Increment LUFCount

Perform LUFInResponse (typically control all loads)

Else LUFStatus is Under-Frequency

If MLP >= UFT_Restore

If (NUFCount<NUFTrigger)

Increment NUFCount

Else

Decrement NUFCount

If NUFCount is Zero or NUFTrigger is zero

Set LUFStatus to Normal

Perform LUFOutResponse (typically restore all loads)

FIG. 10